

Effect of hepatic iron deposition on DWI measurements in liver cirrhosis

H. Chandarana¹, K. G. Do¹, E. Felker¹, C. Hajdu², J. Jensen¹, and B. Taouli¹

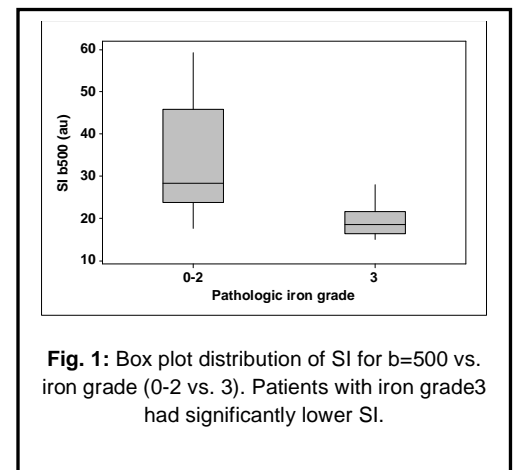
¹Radiology, NYU Medical Center, New York, NY, United States, ²Pathology, NYU Medical Center, New York, NY, United States

Introduction: Multiple studies have attempted to diagnose liver fibrosis using DWI using ADC cutoff values (1-3). However, it is not uncommon for patients with fibrosis and cirrhosis to have concomitant liver iron and/or fat deposition (4). Iron is paramagnetic and contributes to magnetic field inhomogeneity. Signal intensity (SI) and ADC may be affected by the T2 and T2* effect secondary to iron deposition, and this effect has not been investigated on liver SI on DWI and in ADC measurement. The objective of our study was to assess the effect of iron deposition on liver SI and ADC measurements in patients with cirrhosis.

Methods: We retrospectively identified 25 cirrhotic patients (19M, mean age 58 y) who underwent breath-hold DWI (using b=0 and 500 sec/mm²) at 1.5 T within 90 days of liver transplantation. SI was measured in the right hepatic lobe at b=0 and b=500 sec/mm² by a single observer. Liver iron deposition was quantified by an expert hepatopathologist using a 5 grade (0-4) scale (grade 0: absence of hepatic iron and grade 4: severe iron deposition). SI and ADCs were compared in patients with and without hepatic siderosis.

Results: The following distribution of iron deposition was observed: grade 0 (n=10); grades 1-2 (n= 8), and grade 3 (n=6). One patient was excluded from the analysis, as severe iron deposition (grade 4) resulted in low SNR (< 2) on b=500 image. Patients with iron grade 3 had significantly lower SI at b0 and b500 sec/mm² (Table, Fig. 1-3) with moderate negative correlation between iron grade and SI at b=0 and b=500 (r= -0.49; p <0.01 for both). Although there was a trend towards a decrease in liver ADC with iron deposition, this did not reach statistical significance, however more patients are being analyzed.

	Iron grade 0-2	Iron grade 3	P
SI (b=0)	80.4 ± 33.2	41.7 ± 10.9	0.011
SI (b=500)	34.7 ± 16.7	19.3 ± 4.5	0.039
ADC (10 ⁻³ mm ² /sec)	1.74 ± 0.3	1.52 ± 0.3	0.148



Discussion: Decreased SI at b=0 and b=500 in patients with iron deposition seen our study may reflect lower liver T2 in these patients. Furthermore, decrease ADC measurement may be result from T2* effect from iron deposition which is paramagnetic. These changes in SI and ADC are consistent with prior studies which have demonstrated similar changes due to local field inhomogeneity in-vitro and in the brain (5, 6).

Conclusion: Moderate to severe iron deposition affects SI on DWI as well as ADC measurements, and should be taken into account when using ADC for the diagnosis of fibrosis/cirrhosis.

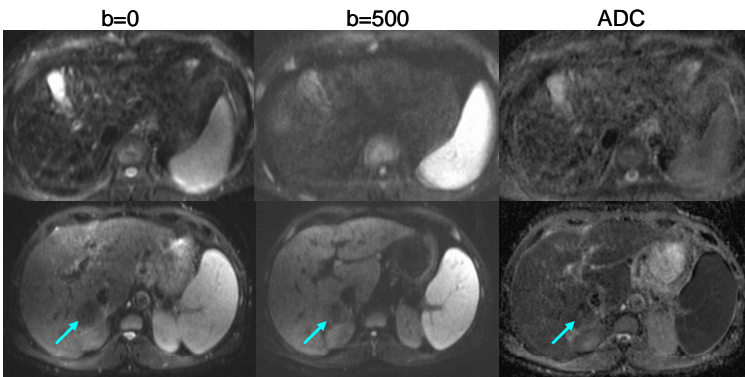


Fig 2 (top): 52 year old male with cirrhosis and iron grade 3 at histopathology. Liver ADC measured 1.48×10^{-3} mm²/sec

Fig 3 (bottom): 66 year old male with cirrhosis and HCC (arrow) and no iron deposition (grade 0) at histopathology. Liver ADC measured 2.14×10^{-3} mm²/sec.

References:

1. Taouli et al. AJR 2007; 189(4):799-806
2. Koinuma et al. JMRI 2005; 22(1):80-5
3. Lewin et al. Hepatology 2007; 46(3):658-65
4. Metwally et al. Am J Gastroenterol. 2004; 99(2):286-91
5. Sener et al. Clin.Imaging 2002; 26(6):371-4
6. Zhong et al. Magn Reson Med. 1991; 19(2):276-84